

Two-Breed and Three-Breed Crosses in Swine: Feedlot Performance and Carcass Merit

R. K. Johnson, I. T. Omtvedt, L. E. Walters, E. Ferrell
and S. D. Welty

Story in Brief

This study was undertaken to evaluate the maternal influence of crossbred gilts and to compare two-breed and three-breed crosses for feedlot performance and carcass merit. The data included postweaning performance of 995 barrows and gilts, and carcass data on 223 barrows of two-breed and three-breed crosses involving the Duroc, Hampshire and Yorkshire breeds.

Overall, there were no significant differences between two-breed and three-breed crosses for any of the measures of feedlot performance and carcass traits evaluated. In general, there was little added heterosis from three-breed crosses over two-breed crosses. All estimates of maternal influence of crossbred dams were very small suggesting that the maternal influence of crossbred dams is equal to the average maternal influence of the pure breeds that made up the cross. It was found that three-breed cross performance could be predicted quite well from the average performance of the two-breed crosses.

Introduction

Crossbreeding studies have shown that three-breed cross litters from crossbred dams are about one pig larger than two-breed cross litters from purebred dams. Crossbred sows are recommended in a commercial swine breeding program in order to capitalize on this heterosis exhibited by crossbred sows as well as to combine the desirable characteristics of different breeds. However, in order to evaluate an overall breeding program, the breed combinations that yield the greatest advantage in terms of combining the strong points of the different breeds for feedlot performance and carcass merit must be known.

This report deals with the second phase of the Oklahoma crossbreeding project where two-breed and three-breed crosses are compared for feedlot performance and carcass merit. When crossbred sows are used to produce three-breed cross pigs and compared to two-breed cross production systems, the difference in performance is due primarily to the maternal influence of crossbred sows compared to the average matern

influence of the purebreds that made up the cross. Therefore, the purpose of this report is to evaluate the influence of maternal effects in crossing sequences for postweaning feedlot performance and carcass merit.

Experimental Procedure

The data involves 995 gilts and barrows involving two-breed and three-breed crosses among Durocs, Hampshires and Yorkshires. The pigs were farrowed in the Ft. Reno swine breeding herd in the 1972 spring and fall farrowing seasons. The feedlot records included 469 three-breed and 526 two-breed cross pigs and the carcass data included 112 three-breed and 111 two-breed cross barrows.

The pigs came from litters that were produced by mating purebred boars of each breed to two gilts of each breed-type not represented in the boar. For example, each Duroc boar was mated to two Hampshire gilts, two Yorkshire gilts, two Hampshire x Yorkshire gilts and two Yorkshire x Hampshire gilts. Five to six boars of each breed were used each season and seven to nine litters of each breeding group were produced in each season. All litters were produced by gilts and a new group of boars was used each season.

The pigs were weaned at 42 days of age and two weeks later were moved to the confinement finishing barn. They were allotted by breed group in groups of about 16 pigs per pen and given a one-week adjustment period before being weighed on test. All pigs were fed a 16 percent crude protein ration (milo, wheat, soybean meal) until they reached 220 lbs. Pigs were weighed off test on a weekly basis as they reached 220 lbs., and all gilts were probed for backfat at that time. As the pigs were weighed off test, a random sample of about nine barrows per breeding group in each season was taken to the University Meat Laboratory and evaluated for carcass merit.

Results

Although the overall performance and carcass traits of pigs born in the spring and fall was considerably different, the differences in the performance of specific breeding groups was approximately the same in each season; therefore, breeding group means are presented averaged over seasons. The growth rate, feed consumption and probe backfat means of two-breed and three-breed crosses is presented in Table 1 and carcass trait means are presented in Table 2.

There appears to be considerable difference between the breeding group means for some feedlot performance traits presented in the upper half of Table 1 and for some carcass traits presented in the upper half of Table 2. However, the differences between these means are due to

three factors: (1) differences in the average performance of the breeds involved in the various crosses, (2) differences in the degree of heterosis expressed by the specific crosses, and (3) differences in the maternal influence of crossbred dams and purebred dams for these traits.

Results from the first phase of this study show some important differences between the purebreds and considerable heterosis for several measures of feedlot performance and carcass traits. To evaluate the influence of a crossbred dam on postweaning performance, the average performance of three-breed cross pigs from crossbred dams is compared to the average performance of two-breed cross pigs when all dams are mated to the same sire breed. For example the maternal influence of Hampshire-Yorkshire crossbred females compared to the maternal influence of Hampshire and Yorkshire dams is estimated from breed group means as follows: $\frac{1}{2}[D(H \times Y) + D(Y \times H) - D \times H - D \times Y]$. Estimates of the maternal influence of crossbred dams for postweaning feedlot performance are presented in the lower portion of Table 1.

There was no significant difference in three-breed and two-breed cross performance for any feedlot trait. All of these differences were very small and not consistent in sign among the various crosses. This suggests that the maternal influence of crossbred dams is equal to the average maternal influence of the purebreds that made up the cross. Although not significant, three-breed cross pigs consumed $0.14 \pm .10$ lbs. more feed per day and gained $0.005 \pm .004$ lbs. less per pound of feed consumed than two-breed crosses. This difference was quite consistent among all breed groups; however, there was virtually no difference in growth rate or probe backfat between three-breed and two-breed crosses.

The breeding group means and specific comparisons among two-breed and three-breed crosses for carcass measurements are presented in Table 2. In general, there was very little difference between the two-breed and three-breed crosses for carcass merit. This provides evidence that the maternal influence of crossbred dams for carcass merit is simply the average maternal influence of the breeds that made up the cross.

These results suggest no added advantage of three-breed cross pigs over two-breed cross pigs for postweaning feedlot performance or for carcass merit. This suggests that three-breed cross performance for these traits can be predicted from the average performance plus the average heterosis of the breeds that made up the cross.

Results from the first phase of this study have shown rather large differences in reciprocal crosses in the production of two-breed cross pigs. In Phase I there was little difference between reciprocal crosses involving Durocs and Hampshires for feedlot performance or for carcass traits; however, Yorkshire crossbred pigs tended to grow faster and more efficiently and to have more desirable carcasses when the Yorkshire was

Table 1. Feedlot Performance and Probe Backfat Breeding Group Means and Comparisons of 2-breed and 3-breed Crosses.

Breed- ing Group ¹	No. Pigs	No. Pens	Avg. daily gain, lbs.	Age at 220 lbs.	Probe backfat of gilts, in.	Average daily feed consumption, lbs.	Feed efficiency gain/ feed
DxH	72	4	1.48	188.2	1.25	4.74	0.318
D(HxY)	67	5	1.52	181.2	1.27	4.92	0.321
D(YxH)	82	7	1.52	186.8	1.23	4.80	0.315
DxY	98	5	1.61	175.6	1.19	4.69	0.335
HxD	77	6	1.55	183.4	1.21	4.86	0.322
H(DxY)	85	6	1.57	181.1	1.11	4.50	0.336
H(YxD)	81	6	1.51	186.5	1.15	4.79	0.319
HxY	82	7	1.54	185.9	1.14	4.40	0.337
YxD	94	6	1.57	180.0	1.24	4.92	0.311
Y(DxH)	61	6	1.59	179.3	1.22	5.42	0.297
Y(HxD)	93	7	1.56	180.6	1.30	4.98	0.307
YxH	103	5	1.55	183.9	1.32	4.95	0.302
Comparison of Pigs Produced by Purebred and Crossbred Dams When Mated to the Same Breed of Sire							
D(H-Y)			1.52	184.0	1.25	4.86	0.318
½(DxH+DxY)			1.55	181.9	1.22	4.72	0.327
Difference			-0.03 ± 0.03	2.1 ± 2.7	0.03 ± 0.05	0.14 ± 0.19	-0.009 ± 0.008
H(D-Y)			1.54	183.8	1.13	4.65	0.328
½(HxD+HxY)			1.55	184.7	1.18	4.63	0.330
Difference			-0.01 ± 0.03	-0.9 ± 2.6	-0.05 ± 0.05	0.02 ± 0.16	-0.002 ± 0.007
Y(D-H)			1.58	180.0	1.26	5.20	0.302
½(YxH+YxH)			1.56	182.0	1.28	4.94	0.307
Difference			0.02 ± 0.03	-2.0 ± 2.3	-0.02 ± 0.04	0.26 ± 0.16	-0.005 ± 0.007
3-breed cross			1.55	182.6	1.21	4.90	0.316
2-breed cross			1.55	182.9	1.23	4.76	0.321
Difference			0.00 ± 0.01	-0.3 ± 1.5	-0.02 ± 0.02	0.14 ± 0.10	-0.005 ± 0.004

¹ First letter designates breed of sire and second, breed or breeding of gilt. (D=Duroc, H=Hampshire, Y=Yorkshire).

the dam breed rather than the sire breed. With a few exceptions the mean differences between reciprocal crossbreds reported here is similar to that found earlier. Previously it was found that crossbred pigs from Yorkshire dams had carcass quality scores that were higher than crossbred pigs of the same breed makeup but with Yorkshire sires. These data do not support this conclusion. More data are needed in order to properly evaluate the maternal influence of these three breeds for carcass quality.

An important question to the swine producer is whether reciprocally produced crossbred gilts differ in their maternal influence. The means in Tables 1 and 2 show, in general, very small differences between reciprocally produced gilts and suggest little, if any, difference in the maternal influence of reciprocally produced crossbred gilts.